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Burns and Scalds;

THEIR TREATMENT,

Bind this cover in front

WITH CASES.

READ BEFORE THE

Sacramento Society for Medical Improvement,

JUNE 25th, 1872.

BY JOS. F. MONTGOMERY, M. D.

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BURNS AND SCALDS,

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By JOS. F. MONTGOMERY, M.D.

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The subject I have chosen for our consideration this evening embraces burns and scalds, terms that express the effects respectively of dry and moist heat, applied, in excess, with more or less intensity; and when we bear in mind the frequency, and often, the frightful and extremely distressing nature of these accidents, we are led to conclude that there are but few subjects of equal importance, or of as much practical interest, to engage the attention of the surgeon or medical practitioner; for upon all who pretend to practise the healing art is likely to devolve, at some time, the duty of dealing with the emergencies presented in these cases. These calamities always come suddenly and unexpectedly, and are frequently so appalling as to bewilder and paralyze those present, who, if cool and self-possessed, might do much to curtail the mischief, or to mitigate the suffering of the unfortunate victims of the occasion. It would be wise and humane, therefore, to keep

the public well instructed as to the course that should be pursued at the instant, or immediately after the occurrence of such accidents; and it is especially incumbent upon every practitioner to investigate and consider well this subject, that he may be prepared to act promptly and judiciously in all respects when called to administer at such times.

I will not consume time by undertaking to present the early history or general literature of the subject, but occupy myself at once with its more practical consideration.

As stated by Samuel Cooper, Thompson on Inflammation, and others, burns are usually divided into three kinds: 1st, such as produce an inflammation of the cutaneous texture, but which is so slight as to tend to terminate in resolution; 2d, those which occasion the separation of the cuticle and produce vesication or suppuration; and 3d, others in which the vitality and organization of a greater or lesser portion of the cutis is either immediately or subsequently destroyed, and a soft slough or hard eschar produced.

Dupuytren described six varieties, and his division has been very generally adopted since his time and up to the present day; but it seems needlessly complex, some of the last mentioned of his series differing only as the gangrenous destruction is more or less deep, or involves the whole bulk of the limb.

Gibson adopts Pearson's arrangement, comprising three species—the *superficial*, the *ulcerated*, and the *carbunculous*.

Chelius favors the division into four distinctions, according to degree: 1st, superficial, resulting in erythema; 2d, the more severe inflammation, resulting in vesication; 3d, the more deeply penetrating, higher inflammation, producing destruction of the cuticle of the mucous net; and 4th, gangrenous destruction of different parts and to various depths.

Gross prefers a simpler division into only two classes, the simple and complicated: comprehending under the former term those lesions which, however extensive, produce only

inflammation, and under the latter those which cause the death of the parts, either on the instant or within a short time after their infliction.

According to my view it would be practically better to still further simplify the matter by discarding all distinctions and classifications, and dealing with the injury as a single affection differing only in degree, and requiring at the outset the same topical treatment and throughout its course such constitutional remedies as, on correct general principles, each case may seem to demand.

Two general methods of treating burns have at all times been pursued. One consists in the application of substances which produce cooling or refrigerant effects, the other in the employment of calefacient or stimulating substances. Of the first, cold water, sometimes containing ice, and saturnine solutions, have been chiefly employed; and of the latter, strong brandy, alcohol, oil of turpentine and other similar agents.

Experience has, in the main, been against cold applications, except after complete reaction and the establishment of inflammation, and then only when the cuticle is unbroken, and so far, or so long as it may be grateful to the patient. If persisted in after causing a sense of chilliness or discomfort, there would be much danger of internal congestions and effusions, perilous to life.

Those favoring stimulating applications, of whom Kentish was particularly distinguished, act upon the idea that the transition from a high to a lower temperature should be slow; and on that theory they have subjected burned parts to exposure to fire or highly heated bodies, and have even gone so far as to pour boiling water upon an already scalded surface. This extreme course has been pursued only by persons holding very radical views, and, being so manifestly irrational, when pressed to the extravagant extent mentioned, has met with very general disfavor. There is really nothing to be eliminated, no "fire to be drawn out." But the application of moderate warmth, without active stimu-

lation or irritation, instead of extreme cold, to recent burns, seems proper enough on general principles. For, while rejecting much advanced by this school, we may safely so far endorse their reasoning as to admit that the sudden transition from a high degree of heat and excitement to the opposite extreme, by the free application of cooling agents, would, in many cases, by producing depression and congestion, endanger the vitality of the injured part; and besides, the sense of chilliness already created by the shock would be but aggravated by such treatment. We know that in frost-bite, or where a portion of the body is frozen, the great indication is to recall the affected parts gradually to their natural condition, by restoring circulation and sensibility cautiously and slowly, not hastily—else vitality would be lost and mortification follow.

Founding his theory upon this approved mode of treating frost-bite, Kentish recommended the primary application of warm and stimulating remedies; and this treatment was generally practised in the coal districts of England, and was extensively adopted elsewhere. But the principle that led to the successful treatment of frost-bite, when applied conversely, or in reversed order, in treating burns, has not been found to be as correct and practical as, by parity of reasoning, it was supposed it would be; and hence, of late, as intimated, it has not been so extensively acted upon as formerly. The treatment recommended, however, under this rather specious theory, doubtless possesses, when wisely modified, some merit; else it would not so long have been pursued by a large number of the profession, nor would it, whether thus tempered or not, still have prominent men as its advocates at the present day.

This diversity of opinion in reference to the management of these accidents relates specially to local treatment, particularly for the first day or two, or until suppuration shall have supervened. As the constitutional treatment must be conducted upon general principles, practitioners are less likely to differ so radically in reference to it as about the local means to be employed.

Extensive burns, as we all know, cause great constitutional or nervous shock, attended with rigors and extreme depression, and there need be no dispute as to the propriety of general stimulation, at least until complete reaction be established. Indeed, it is a matter of the first importance, by the use of opium, stimulants, warm covering, etc., to bring about this reaction, or else fatal collapse is the inevitable consequence. Burns constitute really a disease of depression, and the parties injured require ample nourishment and support throughout the course of the affection. Regarded thus, the predominant opinion should be that moderately warm and soothing applications, to shield the entire surface from the irritating effects of the atmospheric air, and to maintain a uniform temperature, are strongly demanded.

But I will now report a few cases that have occurred in my practice, and then conclude any further remarks of a general character.

CASE 1.—Was called, August 1st, 1857, to see C. McK., æt. 15, then at a farm house ten miles above the city, on the Sacramento river, in Yolo county, confined to bed from the effects of an extensive burn which he suffered some months previously. At the time of the accident he was asleep in a lightly constructed wooden building, when a fire arose that quickly enveloped the frail structure in flames, and before he managed to escape, his head, face, neck, arms, forearms and hands, were burned severely, but not sufficiently to destroy the vitality of the true skin. But from the neck to the hips, the entire back and sides, around to near the connection between the ribs and their cartilages in front, the burn penetrated so deeply as to destroy the vitality of the skin and cellular tissue over that extensive area, so that they were all lost by sloughing. The injury was treated chiefly, as I learned, with mild ointments, as local dressings, and under such treatment that portion superficially affected had healed before my first visit; but that portion from which the skin had sloughed

was covered with a continuous mass of redundant, jelly-like granulations, discharging a large quantity of thin, sanious matter, and showing no disposition to heal. The patient was weak, very much emaciated, feverish, without appetite, and his sleep was inadequate and disturbed, and to add to his other trials, the presence of the ulcer on the back doomed him to the irksome necessity of lying constantly upon the front part of the body, with his face downwards or the head rotated unpleasantly to one side or the other. Having had him removed to the city, for greater convenience, I adopted general treatment, such as an occasional aperient, quinia and mild tonics combined, and plain and nutritious diet, with the view of improving the general health. I employed weak astringents, unirritating agents and water-dressing, covered with oiled silk, as local means. But as it was clear that no real healing could occur, or the healthy cicatricial process could take place, until the unhealthy granulations had been destroyed, different caustics, as solid nitrate of silver, a strong solution thereof applied with a broad soft brush, or potassa cum calce, were applied from time to time, interchangeably, as seemed best. When there was much sensibility on the surface, complete anesthesia with chloroform was produced occasionally and the entire part touched over freely with the most active caustics, followed by a poultice of bread and milk or slippery elm. But the healing process was slow and unsatisfactory under all these agencies. Finally the persulphate of iron (Monsel's Salt), finely pulverized, was dusted through a small gauze sieve over the surface of the ulcer, and under that application the unhealthy and redundant granulations rapidly disappeared, leaving a healthy granulating surface, which was soon covered by a smooth, soft skin, advancing from the circumference towards the center, until three-fourths, or four-fifths, of the entire area was thus embraced. But then a violent fever was set up, attended with a high grade of inflammation in the diseased surface, resulting in phagedenic ulceration that quickly destroyed the recent

reparatory work, showing, apparently, that the too hasty arrest of an habitual discharge or issue had had an unfavorable effect upon the economy, whether in consequence of pyemia or not I will not decide. Supposing that this unfortunate turn in the case was accidental, the same course of treatment was repeated twice afterwards, with a like favorable progress for a time, and then the same unpleasant result. Becoming convinced that the sudden healing and closing of this extensive chronic ulcer exerted a prejudicial effect, as stated, upon the functions of the body, I determined to confine this local treatment to the borders of the ulcer, so as to bring about only a gradual closure and arrest of the discharge, and thus allow the system to become accommodated by degrees to the decided change. By pursuing this plan the entire surface finally became covered with a smooth cicatrix, and the patient was eventually restored to health and usefulness. This happy consummation was not reached, however, until sometime in the spring of 1858, some nine months after the case was first seen by me.

Had skin-grafting been a means in use at the time, I would certainly have put it in practice in this case, and it might have aided materially in bringing about a successful result, the operation being resorted to after first placing the surface in as healthy a condition as practicable. About the time that the idea of effecting a rapid cure was abandoned, and the slower process was determined upon, a small wagon, provided with a lounge, was constructed for the use of the patient, and upon that he was hauled about until he had so far recovered that he could resume the sitting posture, or venture to stand or walk. This passive exercise in the open air had doubtless a good effect, and aided materially in securing the happy termination of the case after so many discouraging disappointments.

During the progress of the case a number of the practitioners of the city were called by me in consultation, as it was one of peculiar interest that excited the sympathy of the benevolent generally. For a time the ulcer was ex-

tremely irritable, and then anodynes and poultices were resorted to, morphia and lupulin being the chief articles used of the former class, and bread and milk or slippery elm of the latter. But the weight of the poultice could not be well tolerated, and plain or soothing ointments and anodyne solutions, with water-dressing, the whole covered with oiled silk, constituted usually the local treatment. On one occasion, I remember, a prominent member of the profession suggested the green leaves of the *datura stramonium* as a suitable application to soothe the inflamed, irritable surface, and they were accordingly thus employed, with caution to the nurse to remove them after a limited time, particularly if any sensible effect, such as was described, should become manifest. The nurse heeded not these warnings, but allowed the dressing to remain. The consequence was that the patient came near losing his life from the poisonous influence of the application, and it was only saved by my chance opportune arrival, the prompt removal of the leaves and the free administration of stimulants and other suitable antidotes. I would warn all against the similar use of so powerful a drug.

I was never very satisfactorily informed as to the exact course of treatment adopted in the outset, and pursued in this case prior to my seeing it; but I am satisfied that if proper treatment, such as I shall hereafter lay down, had been vigilantly and judiciously adhered to from the beginning, a thorough and satisfactory cure could have been insured, and the unhappy patient spared a degree of suffering, and an exhausting drain, that it seems marvelous he could survive and finally recover from.

CASES 2 & 3.—Was called, December 11, 1863, to see two children of Mrs. C., living eight miles from the city, one a female, æt. 16, and the other male, æt. 14, who, the day before, had been severely burned by the explosion of a keg of blasting powder. These two, with an older brother, were together in a sitting-room; the girl sitting with her feet to a stove seeking relief from tooth-ache, while the boys were

engaged in pulverizing the coarse powder, to fit it for fowling purposes, by pouring it upon the solid bottoms of wooden chairs and rolling over it common bottles. In this process it became more or less scattered over the floor, and while the older boy was in the act of pouring upon the bottom of one chair some of this explosive agent, from the keg containing about twenty-five pounds of it, the younger one, in childish thoughtlessness, ignited with a lighted match what was strewn upon the seat of another, simply to remove it thus, instead of by wiping or brushing, when the scattered grains acting as a train, the flame communicated with the contents of the keg and exploded the whole mass. The older boy was so badly injured that he died in a few hours, and the others were affected as stated. These patients were seen soon after the accident by another surgeon of the city, who made the first dressing with cotton batting partially saturated with linimentum calcis. As he could not return, I took charge of the cases, as stated, the following day. The house in which they were at the time of the accident, a single-story frame building, being extensively damaged and rendered unfit, in consequence, for occupancy, they had been removed, each to a separate neighboring house about a quarter of a mile apart, and provided with different nurses.

The girl, F. L. C., whose case I will number 2, was burned over the head, face, neck, a small portion of the back extending from the neck down between the shoulder blades, the arms, the left one deeply, forearms and hands, and the lower extremities from midway the thighs to the soles of the feet.

The boy, W. C., whose case I will number 3, was burned over the head, face, neck, forearms and hands, and the lower extremities from about midway the thighs, as in the other case, to the soles of the feet; and his injuries on the hands and wrists, and on the knees, extending some inches above and below them, were much more penetrating, so that in those parts the sloughing of the skin and cellular tissue was extensive.

In comparing these cases, it will be perceived that the injuries in number 2 were more extensive, but yet more superficial; while in number 3 they were a little less extensive but much more penetrating. In the aggregate they differed but little in gravity. When seen, these patients were both feverish and restless, and complained alike of smarting and general discomfort in the vesicated surfaces. I ordered small doses of morphia, as seemed necessary to allay pain and procure rest, and sulphate of quinia every three hours to control fever and sustain the vital powers. A plain nutritious diet was advised, milk being the chief article recommended; and after renewing the dressing of cotton batting saturated with the oil and lime-water liniment, retained in accurate contact with the body by ample strips of cotton cloth folded snugly about the limb or other part, and secured well with pins, they were left for the night. Before leaving I ordered that ground slippery elm bark should be obtained, that well-cooked poultices of that article might subsequently constitute the regular dressing. Under this treatment they were both made comfortable, and had so far improved by the evening of the 13th, that I was requested, much against my judgment and inclination, not to repeat my visits until called for, the opinion being entertained by an aunt of the children that she could thereafter manage their cases successfully. I heard no more of them until the night of the 16th, when I was summoned to re-visit the sufferers, as a change for the worse in their condition had occurred. I ascertained on arrival that my instructions had been almost totally disregarded as to the management of the girl, and I found her in violent delirium, with high febrile and nervous excitement, divested of all dressings, with the cuticle extensively removed, and tossing from side to side in great apparent agony. The poultice was ordered to be reapplied and retained as well as possible, and the most soothing means were resorted to to restore comfort and quiet, but with indifferent success; and in despite of my best efforts,

she died on the 19th, still delirious from complete exhaustion. Had I been allowed to continue daily visits, and the treatment prescribed had been faithfully carried out, I think it reasonable to believe that recovery would have been the termination of her case. By want of proper dressing, for the exclusion of air, the extensive burned surfaces took on an active inflammation that destroyed life before it could be subdued.

On the 16th the boy was found to be very much depressed, but calm and rational, his nurses having obeyed orders as well as they could, particularly in the matter of keeping the injured surfaces constantly enveloped in the poultice. It was necessary, to prevent fatal collapse, to stimulate him freely for a while; and then, by the use of tonics and nutritious diet, and by attending faithfully to the expeditious and gentle renewal of the dressings at proper intervals, and insuring sleep by the cautious use of anodynes, he finally recovered without any scars of a character to disfigure noticeably ~~in~~ his appearance, or to contract or distort the limbs so as to interfere in the least with their usefulness. In the course of the treatment the poultice was adhered to generally as a dressing, but towards the close of the case mild and gentle astringent ointments were employed in lieu of it. Among other dressings, sub-nitrate of bismuth in glycerin was substituted with a satisfactory result, but it proved to be too expensive for long continued use. Monsel's salt, finely pulverized, and solid nitrate of silver were the agents chosen to repress the excessive growth of the granulations where sloughing had occurred. About four weeks after the occurrence of this accident, scarlet fever appeared among other children in the house, and this patient had the disease severely. This necessarily increased his peril, and rendered his eventual recovery still more gratifying. He is now a stout, healthy young man, engaged in the laborious trade of the blacksmith.

CASES 4, 5 & 6, THAT OCCURRED ON BOARD THE STEAMER WASHOE.

Was called about 4 o'clock on the morning of September 5th, 1864, as were the physicians generally residing here, to attend persons injured by an explosion that had occurred, about 10 o'clock the preceding evening, on board the steamer Washoe, on her trip from San Francisco to this city. The steamer Antelope bore the wounded to the city, and the scene presented in her cabins was appalling and saddening in the extreme, for the floors were thickly strewn with writhing victims, whose piteous cries for help touched every heart and appealed to all to exert themselves to the utmost to alleviate, as far as practicable, the agony they endured. Many had already succumbed to their torture during the eight hours that had elapsed before their arrival, and a number more died before they could be transferred to the Vernon House, which happened to be vacant at the time, and which was quickly converted into a hospital, under the auspices and management of the Howard Benevolent Association of the city. Here, physicians, and others in the character of nurses, worked with the greatest activity, and with wonderful endurance, until all had been placed in bed and had received the best dressing attainable, cotton batting and oil and lime-water liniment constituting the chief of such means. They also received such general treatment as seemed necessary and proper.

These patients fell by chance under the charge of one physician or another, being more or less unequally distributed. Of the thirty-two taken to the Vernon House, (a considerable number having been conveyed elsewhere by their friends,) only three finally recovered. Sixteen of the number, or just one-half, died within the first twenty-four hours, dying mostly from shock, coupled with the severe and extensive injuries that rendered their cases almost if not quite hopeless; and those who survived longer, but whose cases proved fatal, died within from two to twelve days. The three who recovered were of those who

fell to my lot, ten in all. Of these, six were of what may be properly termed the desperate cases, five terminating within twenty-four and the other within forty-eight hours. The seventh was very little better off in the extent and gravity of his injuries than the sixth, but still I had a slight hope of him. He survived to the sixth day, and then died comatose the morning after the nurse in charge at night had administered an undue amount of morphia, in an effort to compose him and procure ^{sleep} ~~help~~ when he was laboring under delirium. This was an unfortunate accident, which occurred notwithstanding great caution had been given against the injudicious use of the narcotic. It would not be profitable to detail these cases, seeing they were of those that may be regarded as necessarily fatal.

Case 4.—W. S., fireman, æt. 27, married, stout, and had previously enjoyed good health. He was extensively scalded by steam over the head, face, neck, upper part of the chest in front, upon the arms, forearms and hands, as also upon the nates and thighs; the most of the trunk and the lower extremities, from above the knees downwards, escaping. He had also inhaled steam, as he informed me when I first met him on the steamer, and from the first he breathed with difficulty and was much troubled with cough. His condition seemed indeed hopeless. He continued for two or three weeks to be harassed with a violent cough and distressing dyspnea, and several times had severe epileptiform convulsions in which he came well nigh expiring. The first dressing in his, as in the other cases, was the cotton and liniment already mentioned; but all subsequent dressings consisted of finely ground slippery elm bark, well cooked into a soft, pulpy, tenacious poultice, having a little sweet oil added, and so abundantly applied that the surface of the scald was fully shielded from the air, and kept soothed by the continual presence of the soft dressing, oiled silk covering the whole when it was agreeable, or seemed necessary to retain moisture and maintain softness and warmth. Morphia was administered cautiously, when

needed to relieve pain and procure sleep, quinine was used as seemed necessary to control periodical fever, and a well considered expectorant was prescribed to allay in some measure the cough. A plain nutritious diet was allowed, milk being a material portion of it, because it was well relished. Under this general course of treatment, and the careful, and faithful nursing he received from his wife and other friends, he, in due time, gradually recovered without any unsightly mark upon any part of his person, and without the slightest contraction or disability about his hands to impair their usefulness, although the skin upon them had sloughed considerably. He was finally discharged, cured, on the 10th of November, just two months and five days from the time of the accident.

Case 5.—J. C., deck-hand, æt. 35, married. Was extensively scalded by steam on the head, face, neck, arms, fore-arms, hands and upon the front part of the chest; but the trunk with the exception mentioned, and the lower extremities escaped. He was similarly treated as was number 4, and was discharged, cured, Oct. 20th, having been under treatment only one month and fourteen days.

Case 6.—S. W. H., cabin-boy, æt. 20, single. His scalp cheeks and lips were deeply and extensively lacerated and some teeth knocked out by fragments of iron, and he was burned superficially upon the head, face, and neck, and very deeply upon one of his arms, his forearms and hands, and upon one leg about the knee. The injury to the fore-arms and hands was so penetrating as to result in deep sloughing, and to endanger the loss of those members from mortification. But the faithful use of large fresh poultices led to the early separation of the eschars, and promoted the slow but gradually advancing reparation of the injuries by healthy granulation and cicatrization, the resulting new skin being smooth and supple, caustic applications having been made from time to time as seemed necessary to prevent redundancy in the reparatory growth. On Dec. 1 the case had so favorably progressed, or the ulcerated surfaces

had become so completely covered with newly formed integument, that it was dismissed. But on the 14th of that month, when again seen, active inflammation had become established in the forearm and hands, and the entire injured surfaces on those members had lost their cuticle and become suppurating ulcers. This change occurred doubtless in consequence of too free indulgence on the part of the patient in rich and stimulating food, and the no less free use of alcoholic drinks. This imprudent and unauthorized living, so heated and deranged the system that the case gave much subsequent trouble, improving for a time and then suddenly becoming aggravated in its condition, once, as he claimed, because of an error committed by a druggist, in compounding medicines prescribed for a topical remedy. It finally terminated satisfactorily, and the patient was discharged, cured, Feb. 14th, 1865, and had thereafter no further trouble. His hands, although their soft parts had been so deeply destroyed, were supple and unimpaired in any of their motions. These back-sets and changes in this case have been prominently brought forward to impress upon all the importance of a plain, simple mode of living, and the observance of the greatest prudence in similar cases, until the cures shall have become fully confirmed. These cases, by want of proper care, are apt to become extremely intractable.

CASE WHICH OCCURRED ON BOARD THE STEAMER YOSEMITE.

Was called, with other physicians, at 3 o'clock A. M., October 13, 1865, to visit, on board the steamer Yosemite, persons injured by an explosion that had occurred a few hours previously on that vessel, while on her way from San Francisco to this place. The scene presented was similar to that described as having been met with in September, 1864, on board the Antelope, and was of a most distressing character. The chief difference noticeable was in the larger number of those who had suffered the infliction of lacerated wounds and broken bones, from having been

stricken by fragments of the boiler and other solid bodies, and of others who were stunned and prostrated by the violent concussion caused by the explosion.

Of these cases I had regular charge of five, their injuries embracing scalds, lacerated wounds and fractures, one of fracture of the clavicle; but I will report but one of them, as already indicated, and which, in regular order, will be Case 7.—T. C., æt. 30, single, was very severely and extensively scalded upon the head, face, neck and front part of the chest, and upon the forearms and lower extremities. He was also so excessively shocked by the violent concussion that he was stupefied and scarcely conscious for several days. Then, high febrile reaction occurred, attended with raving delirium, so that he often cried out at the very top of his voice, and required constant strict attention, and considerable restraining force at times, to retain him in bed. This unpleasant symptom was controlled more by ice to the head and upper part of the spine, judiciously applied, than by anything else. The first dressing in this case, as in others, was cotton batting and oil and lime-water; all used subsequently being slippery elm poultice. The scalds, although so extensive, and notwithstanding the existence of high febrile excitement, did well, and finally healed in good time. But the injury to the nervous system proved to be irreparable; for the gentleman was ever after troubled with extreme nervousness and wakefulness, and haunted with such unpleasant thoughts and fancies as to render his life miserable, and to necessitate almost constant treatment with various nervines, including the bromides, to enable him to obtain a moderate amount of sleep and partial comfort. His mental powers were evidently seriously impaired by the severe concussion and succeeding inflammation, the derangement manifesting itself, as is usual, more at some times than at others; and finally he so brooded over his real or supposed injuries and wrongs as to become dangerously homicidal in disposition, and to compel his removal, as a public duty, to the Insane Asylum, where he

now is. Had chloral been in use at the time, I think it likely it would have materially benefitted his case at a critical period, by securing the calming, refreshing effects of sleep; and possibly its happy agency might have so far checked or weakened the pernicious influences operating upon the brain as to have averted the sad termination which ensued.

CASE 8.—Was called, June 13, 1871, to see A. B., a boy æt. 9 years, who, it was reported, had been badly burned. Nearly two hours before I saw him, while standing near a cauldron of boiling tar, sunk to its top in the earth, he was induced to jump into the seething mass to save himself from the worse disaster of falling in, perhaps head foremost, in consequence of receiving a sudden push from behind, from a mischievous companion, and thus sustained a frightful burn on the feet and legs, nearly up to the knees. I found him sitting on the floor of his father's porch, without any covering on the injured parts, quivering in agony from his wounds. As quickly as possible I had him placed upon a bed, and then enveloped the affected surfaces in the usual dressing of cotton batting and oil and lime-water liniment, having provided myself in advance with these articles, after learning the nature of the case. I also administered an anodyne. Apprehending that the depth to which the vitality of the soft parts had been destroyed might endanger the extremities, if not the life of the patient, I had an ample quantity of slippery elm poultice prepared, and subsequently used as the regular dressing, carbolic acid in sweet oil being added as an antiseptic. Under this dressing, well prepared and faithfully changed two or three times a day, with the judicious use of anodynes as they were demanded, and the employment from time to time of quinia to allay the violence of fever, which was in his case more or less periodical, he finally recovered without any deformities to impair the freedom of motion in his limbs. But the vitality of the skin and cellular substance was so completely destroyed as to cause extensive sloughing, in-

volving a considerable portion of the muscular tissue. Nevertheless, in about three weeks healthy granulations appeared, and rapidly restored the lost portions of the soft parts, and by July 20th, it became necessary to apply solid nitrate of silver to curb redundancy in their growth, and prevent the formation of those thick bands of cicatricial matter that operate so viciously to contract or distort parts one way or another, and thus impair seriously their freedom of motion and general usefulness. The same dressing was, however, continued to the end, the caustic was applied as seemed necessary to insure the normal exercise of the reparatory effort, and the production of a smooth supple covering, in lieu of the original skin. Under this course the case finally terminated in a perfect cure, and the patient was discharged on the 10th of October, nearly four months after the receipt of the injury. He has had no trouble since, and his limbs are now quite as useful as they had ever been.

Having now presented these cases of burns and scalds as true types of such accidents, as they are usually met with, I will close this paper with a few general remarks, as a summing up of the subject.

We must set out with the idea that these affections constitute, as it were, a single disease, differing only in degree, and that they must be treated on enlightened general principles, and not empirically, as has been too often the case, by employing some dressing arbitrarily, simply because it may have been recommended for the particular accident, without a just consideration of the real indications to be fulfilled.

The two leading and most imperative of these indications are to counteract the effects of the shock, and soothe, compose, and restore to normal condition the nervous system, and to exclude and shield from the air the entire surface. The first step should be, therefore, to administer anodynes and stimulants, and the next to apply anything at hand calculated to fulfill the second indication, as flour, carded cot-

ton, soft cotton cloths spread with fresh lard or simple ointment, or moistened with sweet oil, cream, or even warm water, and applied closely and gently to the surface by being folded smoothly and then retained by pins, every care being taken to preserve the cuticle as the natural protector of the rete mucosum; and to so preserve it, the greatest pains should be taken in removing the clothing, where it has been left by the flame, or where the injury has been inflicted by hot liquids or steam. Indeed, no removal in the latter case should be resorted to, until some soothing application shall have been provided better calculated to afford proper protection from the air than the clothing then on the person. In the excitement of the moment a patient thus injured is likely to be roughly handled, his clothes being rudely torn or removed from his body, thus not only endangering extensive destruction of that natural investiture, the cuticle, but producing complete pernicious exposure of the injured surface before proper provision has been made for a more suitable shield than his apparel. Better let the victim rest for a while as quietly as possible, until an anodyne can be administered by one while others may prepare the best dressing accessible. While these things are being done, an ample supply of cotton batting or wadding and linimentum calcis should be ordered, and provision be made to have the latter slightly warmed before being applied. As this dressing can usually be quickly had, it serves well for a first dressing, although its offensiveness renders it objectionable for subsequent use. But simultaneously steps should be taken to provide a like ample supply of finely ground slippery elm bark, or linseed meal, or bread and milk, so that they may, any of them, be made into poultices for the second or subsequent dressing, or even for the first, where the cotton and liniment mentioned could not be readily had in sufficient quantity. Where the shock to the nervous system is decided, attended with much depression, stimulants should be unhesitatingly used to any extent necessary; and wherever there is a tendency

to coolness of the extremities or of the general surface, dry warmth should be applied and sufficient covering for comfort be thrown over the sufferer. The digestive organs should, by proper means, be kept in a healthy condition, but active purgation should be avoided. Anodynes, to the extent necessary to maintain comfort, are imperatively demanded, but they must be employed with all due caution, decided narcotism being guarded against. As there is usually, here at least, a strong tendency to fever of a periodical character, quinia can generally be used with marked advantage until the paroxysms be arrested; and after the commencement of suppuration, tonics and nutritious diet are indispensable. Indeed, throughout the treatment proper nutrition should be insured, milk being generally one of the best articles of diet to be had, both because of its easy digestion and assimilation, and of its acceptability to the patient. But no arbitrary rule should be laid down as respects diet, but the taste and peculiarities in each case must be respected. As a soporific, I would be much inclined to employ chloral, but as I have used it only in the last case reported, where its action was satisfactory, I cannot vouch for its efficacy as a general thing. As soon as the granulations become redundant they should be touched with the solid nitrate of silver, and this agent should be employed from time to time as may seem necessary. A strict watch should be kept over the progress of cicatrization, for I am satisfied that the timely and judicious use of the caustic materially hastens the healthy healing of the ulcer, and prevents the formation of vicious cicatrices, that have so often entailed unsightly and damaging deformities upon those whose injuries may have been of a penetrating and destructive nature. I believe that no other dressing than the poultice need be employed throughout the entire treatment, for under the judicious application of the caustic named, an integument, smooth and supple, will be formed, even where the true skin and some subjacent tissue may have been completely destroyed. It may be that my experience has

been too limited, and my field of observation too contracted, to establish a general principle upon what may have been noted in the few cases observed; but as every variety of type has been represented in these comparatively few cases, I think we are justified in assuming that the same course of treatment that proved eminently successful in the few typical cases, would prove alike successful in many of like character. I would refer particularly to cases 3, 4, 5, 6, 7, and 8, as embracing, among them, the several varieties; and as in case 4, one of the Washoe victims, and case 7, one of the Yosemite unfortunates, we have presented, I may safely claim, and as was generally conceded, the very worst of any that recovered belonging to his respective group; and as in cases 6 and 8 we have two well marked instances of deep sloughing without any resulting contraction or other deformity to impair usefulness of limb, I think we may justly assert that there is real merit in the particular plan of treatment here advocated. It may be argued that having ten of the Washoe victims with only three recoveries, the success was not such as to justify the claim of any special virtue in the treatment; but it must be remembered that most, if not all, of these fatal cases were, as reported, such as were almost necessarily fatal, five of them having terminated within twenty-four hours, and the other two in two and six days. The only one of these for whom I entertained any hope, as already stated, was the man who died on the sixth day, and he perished in consequence of the incautious administration of morphia. The other six cases, it may be assumed, were necessarily fatal, or were of so grave a nature as to render recovery altogether improbable. The chief error, if any, in treating these cases, if anything could have availed, was the too sparing use of stimulants and the consequent failure to overcome the very depressing effects of the shock.

I would not institute any invidious distinction or damaging comparison in favor of the course of treatment here urged, and against any which may have been pursued

by my professional friends in the management of other victims of the same disaster. They, so far as I could judge, from my limited observation, carried out the plan of treatment laid down in standard authorities, and thus were led to employ ointments spread upon lint, or linen, or cotton cloth, and retained in place by neatly applied rollers. All this looked well, but inflammation ensued, high febrile and nervous excitement followed, and the patients finally succumbed. Even the cotton and linimentum calcis as a local treatment will agree only for a day, according to my experience, inflammation showing itself, if the dressing be persisted in after that time, and the parts affected becoming perfectly intolerant of its further use.

These injuries should be regarded and treated as any other vesicated surfaces, whether the vesication be produced by cantharides, or other violent irritant. We all know how unfortunate it is to have any ordinary blistered surface take on inflammation, and how great is often the constitutional disturbance caused by it when only a small surface, six or eight inches in diameter, is involved. How immeasurably greater, therefore, must be the pernicious effects of such an inflammation when one-half or two-thirds of the entire surface of the body may be thus affected. It is rare that we witness a condition more painful or distressing than this, or one more likely to exhaust the vital powers. When inflammation becomes established in a part blistered by cantharides, we know that nothing, as a general thing, affords such relief as a soft poultice ; and our experience in such cases on a small scale should lead us to adopt it on a larger. Burns are often so long exposed to the air before being seen by the surgeon, that the inflammation so much to be dreaded is already set up ; but whether that be the case or not, the poultice, I hold is the safest application for such surfaces from the beginning to the end ; and when applied early, they generally entirely prevent, as they do after the use of an ordinary blistering plaster, the undue inflammatory action mentioned.

I remember seeing a report some years ago by Dr. Wooster of San Francisco, where in view of the importance of maintaining perfect occlusion of the surface from contact with the atmospheric air, he treated an extensive burn by applying the cotton and oil and lime-water liniment dressing, and never removing it until a most satisfactory cure had been effected, his plan being to patch the covering of cotton as became necessary, and to keep the whole of it constantly moistened by pouring on the liniment as needed. But this seems so offensive and disgusting a way to deal with such cases that I cannot endorse his plan. His treatment of the case accords with my view as to the importance of occlusion, but not as to the particular dressing to accomplish that object. That which he employed I have found to disagree after the first day or two ; and even in his case he relied, I remember, more on the laudable or normal pus, nature's dressing, than upon the application ostensibly used. In practice I am sure, the plan here advocated could not fail to be preferred to his. I usually found two daily dressings, quickly changed, and without washing ever, necessary to the comfort of patients ; and to maintain softness, sweet oil was freely used upon the poultices, an addition that was popular with the afflicted, and one that clearly exerted no unpleasant effect. Indeed, it was most gratifying to witness the unmistakable evidences of comfort enjoyed by those thus dealt with, after the active inflammation had been once subdued. They slept well, relished their food and progressed steadily and uninterruptedly to a satisfactory recovery.

I may add that oiled silk was, and may well be, used, not only to protect the bedding but to cover the dressings and keep them warm and moist, the use of it as a covering being discontinued whenever the retention of heat caused by its presence may become disagreeable to the patient. I may further add that where the hands are involved, they should be kept well extended, fingers stretched widely apart, and the poultice so applied as to fill up the inter-

spaces and thereby prevent any improper union of opposing surfaces. These suggestions hold good also as to any other ulcerated surfaces liable to vicious union when retained in contact, and are offered to encourage vigilance to hinder any such faulty adhesions.

I have dwelt much and earnestly upon this subject because of my desire to do what I may to insure relief to the suffering, and from a strong conviction that the general plan here presented promises more than any other towards the accomplishment of that purpose. In examining various authorities, Chelius is the only one I met with who favors poultices, (bread and milk being his favorite,) as the local dressing for burns throughout their entire course, and I was not aware until very recently that even he had advanced that idea.

